(12) UK Patent Application (19) GB (11) 2 218 880 (13) A

(43) Date of A publication 22.11.1989

(21) Application No 8903062.1

(22) Date of filing 10.02.1989

(30) Priority data
(31) 8803305 (32) 12.02.1988 (33) GB

(51) INT CL'
H04M 1/02

(52) UK CL (Edition J)
H4J JK J36B J36E

(56) Documents cited
GB 1567548 A GB 1132378 A

(58) Field of search
UK CL (Edition J) H4J JK JL
INT CL' H04M

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(54) Telecommunications terminal

(57) A telecommunications terminal has, in place of a handset, a directional microphone 22 and loudspeakers 26 arranged to generate audible sound only within a predetermined region 28 which is located such that the head of the user will be in the region when he is using the terminal and, in place of a dialling mechanism, a voice recognition circuit arranged to generate dialling signals in response to numeral words spoken by the user in order to dial the spoken number.

FIG.1.

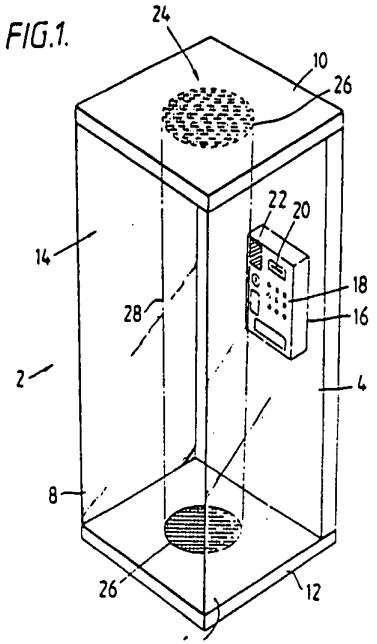

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FIG.1.

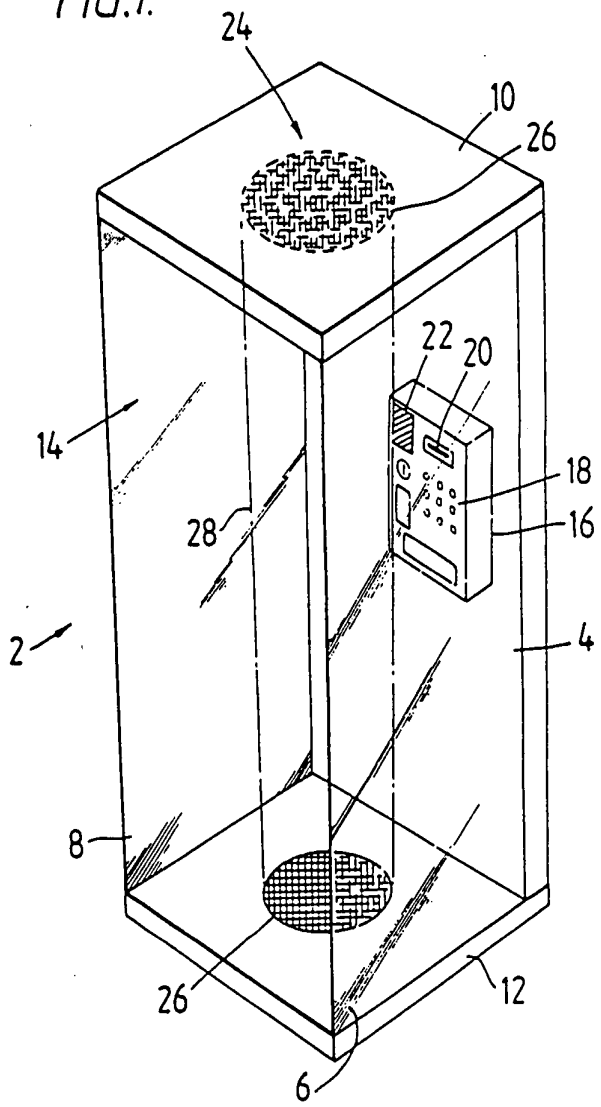

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FIG. 2.

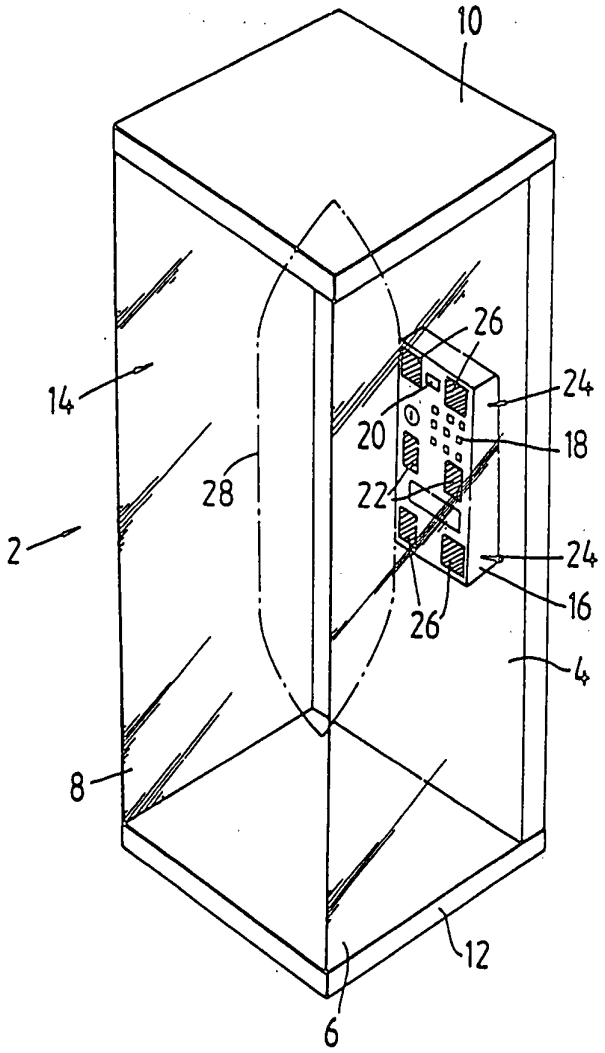

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FIG. 3.

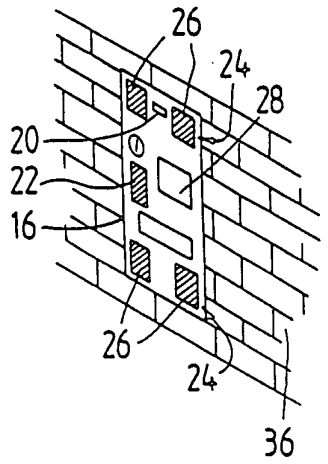
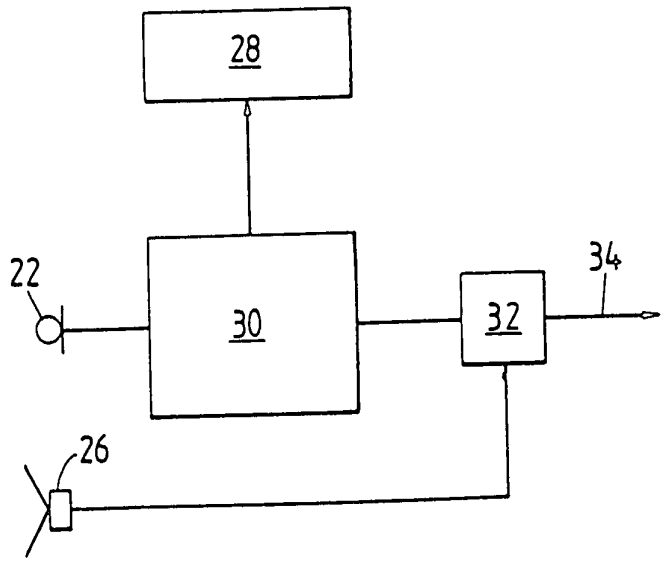


FIG. 4.



TELECOMMUNICATIONS TERMINALS

This invention relates to terminals, preferably telecommunications terminals, and particularly to terminals for spoken communication such as pay phones for public use, and/or terminals in which the user is required to issue a limited number of commands, such as the dialling commands given in the payphones referred to above, or the identification number entries given in bank cash dispensers, etc.

A problem with such telephones is that they are subject to damage, particularly due to vandalism. The handset is especially vulnerable, and can be used to damage other parts of the equipment. The dialling mechanism normally includes moving parts accessible by the public and is therefore also vulnerable to damage through abuse or vandalism. Furthermore, dialling mechanisms, be they rotary or push button, require a certain degree of dexterity on the part of the user and it is not uncommon for some disabled people to experience difficulty when dialling a number.

It would be desirable to avoid or at least mitigate these problems.

According to one aspect of the present invention a telecommunications terminal, such as a telephone,

has a sound transducer responsive to the received sound signal for generating audible sound, wherein the sound transducer is of a type which confines the audible sound generated thereby to a predetermined region, and wherein the region is so arranged that the head of a user of the terminal can be located therein, preferably regardless of his or her height.

The use of such a transducer removes the need for the user to hold a handset in proximity to his ear in order to hear the received sound. Preferably the region within which the sound can be heard is in the form of a substantially upright column, thus facilitating the use by people of different height. It will be appreciated that the use of a sound transducer of the type in which sound is confined to a predetermined region permits the user's conversation to be confidential. Such an arrangement also permits a more convenient use of the equipment, especially for disabled people, e.g. those confined to wheelchairs, and can lead to clearer sound quality than conventional equipment particularly if both the user's ears can hear the emitted sound. In a preferred embodiment of this aspect of the invention, a sensitive, preferably directional microphone is mounted in the equipment so that no handset is required.

According to a further aspect of the invention, a telecommunications terminal, such as a telephone, has two more directional microphones positioned and interconnected so as to be particularly sensitive to sound emitted in a substantially predetermined region in which the head of a user is likely to be located. Preferably, this is combined with the aforementioned aspect of the invention, and the region within which audible sound is generated is preferably substantially the same as the region in which the microphones are particularly sensitive.

Alternatively or additionally, the microphone(s) may be directed mechanically or electronically towards the head of the user under the control of for example an infra-red detection unit which dynamically tracks movement of the user during the conversation. This control technique, which is considered to be independently advantageous, could additionally or alternatively be applied to the speaker(s). Thus, according to a further aspect of the invention, one or more microphone(s) or speaker(s) of a telecommunications terminal is/are arranged to be directed in response to sensing means for sensing at least the approximate position of a user's head.

According to another aspect of the invention there is provided a telecommunications terminal

including a microphone into which a user can speak and a voice recognition circuit connected to the microphone, the voice recognition circuit being provided with means for generating a dialling signal in response to words spoken by the user in order to dial the spoken number.

The use of a voice recognition circuit reduces the susceptibility of the terminal to damage by removing the need to provide a dialling mechanism with moving parts. Preferably the microphone and voice recognition circuit are mounted within the telecommunications terminal so that no handset is required. It will be appreciated that by providing a hands free dialling arrangement there will be many advantages when it comes to use by disabled people.

Preferably the voice recognition circuit will only be responsive to certain instructions followed by a sequence of numerals initially spoken by the user, and it may be advantageous to provide a display means for displaying the numerals.

In addition to reducing the susceptibility of the terminal to vandalism, the invention provides a telecommunications terminal which is compact and which can be mounted flush to an outside wall of a building thereby enabling terminals to be installed at locations where the likelihood of obstruction being

caused hitherto prevented such terminals from being so provided.

Arrangements embodying the invention will now be described by way of example with reference to the accompanying drawings, in which:

Figure 1 shows a telephone booth having installed therein a telephone according to a first embodiment of the invention;

Figure 2 shows a modified version of the telephone;

Figure 3 shows a telephone according to a second embodiment of the invention; and

Figure 4 is a schematic circuit diagram of the telephone in Figure 3.

The telephone booth 2 of Figure 1 has a rear wall 4, side walls 6 and 8, a top wall 10 and a base 12. Although shown with an opening 14 to allow access to the interior of the booth 2, a door could be provided if desired.

A telephone receiver inside the booth comprises a main unit 16, which may be identical to a conventional pay phone except in respect of the points discussed below, and which may for example include a push-button keyboard 18 or alternative means to permit dialling and a slot 20 for receiving coins or possibly a magnetically-encoded card. The unit 16 may be flush-

mounted in the rear wall 4.

In place of the conventional handset for the telephone, there are provided a directional microphone 22 flush-mounted in the main telephone unit 16 and a sound transducer 24 coupled by leads (not shown) to the main unit. These leads may be built into the structure of the telephone booth so that they are inaccessible to users.

In the present embodiment, the transducer 24 is formed of a plurality (in this case two) speakers 26 which are so designed that a predetermined region within which audible sound can be heard is defined by the interference between the outputs from the speakers. One preferred way of achieving this is for the speakers to be arranged to emit high-frequency, inaudible sound, the frequency from each speaker being modulated in a different manner by the received sound signal. The effect of this will be that the sound signal will be audible as a beat frequency in the region in which the speaker outputs interfere.

This region is indicated at 28 in the accompanying figure. As indicated, it is preferred that the speakers be arranged in the top and bottom walls of the booth, and that they be physically configured according to known methods so that sound is emitted in a directional manner. By virtue of this

arrangement, the region 28 is in the form of a column positioned in front of the main telephone unit 16. The advantage of a columnar region is that it provides for large variations in the height of the user. Other arrangements are possible. For example, the speakers 26 could be positioned directly above and below the telephone unit 16, and arranged so that the emitted sound is aimed in an inclined direction, which would result in the zone within which the audible sound can be heard being positioned in front of the unit 16, where the user's head is normally located.

The region 28 is preferably positioned such that a user with his head in the region is able to reach the keyboard. Preferably the region extends away from the main unit 16 only to a predetermined limit, which is within the confines of the booth 2, so that no one outside the booth can hear the received sound signal.

There is preferably a marking, e.g. on the floor 12 of the booth, to indicate the optimum position at which the user should stand to hear the received sound signal.

The directional microphone is positioned such that it receives sounds emanating from the user while his head is in the region 28.

Figure 2 shows a preferred modification of the first embodiment, which uses a self-contained unit 16

housing both speakers and microphones, which is even less subject to vandalism, and which is less costly to install. Elements corresponding to those in Figure 1 have been given the same reference numbers. In Figure 2 there are four speakers 26 in place of the two in Figure 1. The four speakers are flush-mounted in the unit 16, which is itself flush-mounted in the wall 4.

The interference of the outputs of the directional speakers 26 generates a column 28 of sound so that, again, a user can hear the received sound signal regardless of his or her height.

In this embodiment the microphone 22 has been replaced by a pair of horizontally-spaced microphones 22 directed at the column 28 and having their outputs combined, so as to provide a clearer signal which is less subject to interference from outside sources. Alternatively, the microphone 22 may be replaced by a microphone or array of microphones directed mechanically or electronically toward the head of the user under the control of an infra-red detection unit which dynamically tracks movement of the head of the user in order to give the user greater freedom of movement whilst still providing a clear signal which is substantially free from outside interference.

In Figures 3 and 4 a second embodiment is shown in which the dialling mechanism has also been removed

from direct access by the user. A display 28 is provided in place of the dialling mechanism and, as shown in Figure 4, the microphone 22 is connected to a voice recognition circuit 30 the output of which is connected to a line interface 32 for driving telephone lines 34 and for separating received speech signals to drive the speaker or speakers 26. In order to provide a degree of confidence to the user when dialling a number, the voice recognition circuit 30 can additionally be connected to the display 26 so that the numbers being spoken are displayed for inspection by the user. The arrangement may be such that the numbers are dialled only after the user has spoken a confirmation.

The voice recognition circuit 30 is arranged to identify control words and numerals spoken by the user and includes means for generating dialling signals to be passed on to the lines 34 in accordance with the spoken numerals. Once the number has been dialled by the voice recognition circuit 30 its function in the telephone circuit becomes redundant until the user wishes to terminate the call. The voice recognition circuit can be bypassed after the number has been dialled to provide a direct line between the microphone 22 and line interface 32. When the user wishes to terminate the call, the voice recognition

circuit may be reactivated in order to execute a disconnect operation.

If the voice recognition circuit only disconnected a call in response to spoken commands by the user it is likely that the connection would be left in place by some users. In the case of a coin or card operated telephone this would not present too much of a problem because once the credit was exhausted the telephone would automatically disconnect. However, because this requires an active role to be played by the user it is preferably that the voice recognition circuit 30 monitors the call and automatically disconnects the telephone when sound signals have not been active in either direction after a predetermined period of time.

It is to be understood that features such as the microphone and speaker arrangements described in relation to the first embodiment are intended to apply equally to the second embodiment and that therefore no further description of these features is necessary. In this embodiment, however, there is no booth 2. It will be noted that the front face of the unit 16 is substantially flush with a wall 36 in which it is mounted.

Although the above embodiments are in the form of telephones without a handset, permitting hands-free

operation, certain advantages of the invention can be achieved even if a handset is provided, in which case the handset may be of a conventional type or may incorporate only a microphone and no speaker. In any event, the use of the sound transducer 24 may provide advantages in terms of increased amplitude of the received signal, improved clarity particularly if the region encompasses both ears of the user, radical reduction of noise interference from surrounding traffic, etc., and ease of use.

It will be appreciated that although the invention has been described primarily in relation to a public telephone this should not be considered to be limiting in any way. Indeed, the invention may be applied in such areas as video-text terminals, personal computers, electronic mail boxes, bank cash dispensers, etc. In the case of cash dispensers or the like, entry of identification numbers could be achieved by a voice recognition circuit, preferably coupled to one or more microphones arranged to be dynamically directed toward the user and/or to be particularly sensitive in a region wherein the user's head is located. Audible instructions and/or information may also be generated using speaker arrangements similar to any of those described above.

CLAIMS:

1. A telephone having a sound transducer responsive to the received sound signal for generating audible sound, wherein the sound transducer comprises a plurality of speakers and is arranged to confine the audible sound generated thereby to a predetermined region defined by the interference between the outputs of said speakers, and wherein the region is so arranged that the head of a user of the telephone can be located therein.

2. A telephone as claimed in claim 1, including a directional microphone and means for supporting the microphone in a position in which it can detect the voice of a user whose head is located within said region.

3. A telephone as claimed in claim 2, including means responsive to the position of the user for directing the microphone toward the user.

4. A telephone as claimed in claim 2 or 3, including a plurality of microphones arranged to be particularly sensitive to sound emitted in a region

which is substantially the same as said predetermined region.

5. A telephone as claimed in any preceding claim, wherein the speakers are housed in a telephone unit which also supports dialling means for the telephone.

6. A telephone as claimed in any preceding claim, wherein the speakers are arranged to generate high frequencies, and audible sound is produced by beats between these frequencies.

7. A telephone as claimed in claim 6, wherein the high frequencies are inaudible.

8. A telephone as claimed in any preceding claim, wherein the predetermined region is positioned such that a user with his head in the region can operate the telephone.

9. A telephone as claimed in any preceding claim, wherein the predetermined region is in the form of a substantially upright column.

10. A telephone as claimed in any preceding

claim, including a voice recognition circuit responsive to words spoken by the user for generating a dialling signal to dial a number.

11. A telephone booth housing a telephone as claimed in any preceding claim, wherein the predetermined region is located wholly within the booth.

12. A telephone booth as claimed in claim 11, including a marking to indicate to a user where he should be positioned in order that his head should be located within the predetermined region.

13. A telecommunications terminal including a microphone into which a user can speak and a voice recognition circuit connected to the microphone, the voice recognition circuit being provided with means for generating a dialling signal in response to words spoken by the user in order to dial the spoken number.

14. A terminal according to claim 13 wherein a display is provided for displaying numbers corresponding to words spoken by the user.

15. A terminal according to claim 13 or 14

wherein, in response to predetermined spoken commands, the voice recognition circuit disconnects the terminal from the dialled number.

16. A terminal according to any one of claims 13 to 15 wherein the microphone is directional.

17. A terminal according to claim 16 including means for directing the microphone towards the user in response to a sensor for sensing at least the approximate position of the user.

18. A terminal according to claim 17 wherein the microphone is dynamically so directed as the user moves.

19. A terminal according to any one of claims 13 to 18 wherein a sound transducer responsive to received sound signals for generating audible sound confines the audible sound generated to a predetermined region in which the head of a user is likely to be located.

20. A telecommunications terminal substantially as herein described with reference to Figure 1, Figure 2 or Figures 3 and 4 of the accompanying drawings.

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